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ABSTRACT

The report briefly reviews research on the concepts of attention, memory, and linguistic deficits, as well as maturational lag and interactive factors; and considers possible implications for assessment and instruction of reading disabled/dyslexic children. Early theories relating to dyslexia or specific reading disability are traced from S. Orton's first theoretical paper to such recent theories as that of intersensory integration. Problems in definition of learning disability are noted, as well as the confusion regarding etiology. Selected research is cited and implications for assessment and instruction are drawn from the findings. Among conclusions are the following: early identification of potential reading difficulty through predictive test batteries is often valid; while informal assessment may have disadvantages, recent theories increasingly warrant such techniques with dyslexic children in the absence of valid standardized approaches; few valid subclassifications of dyslexia exist which enable teachers either to group such children for instructional purposes or to match a particular remedial program to an individual child; and daily instruction is needed to produce gains in disabled readers. (SB)

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RECENT CONCEPTS IN DYSLEXIA:

IMPLICATIONS FOR DIAGNOSIS AND REMEDIATION

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INTRODUCTION

Past theoretical approaches to the study of dyslexia, largely rooted in neuropsychological etiology, tended to emphasize perceptual deficits as primary causes of reading disability. More recent thinking has focused on attention, memory, and linguistic deficits, as well as on maturational lag and interactive factors. In this report, these concepts are briefly reviewed, and possible implications for assessment and instruction of reading disabled youngsters are discussed.

As is generally the case in the literature on this topic, the terms dyslexia, reading disability, learning disability (where used to refer primarily to reading difficulty), and other such terminology are used interchangeably. The reader should be cautioned, however, that there is considerable controversy related to the definition and use of these rubrics, as will be discussed later in this report.

EARLY THEORIES

Since its discovery at the turn of the century (Hinshelwood ,1900; Morgan 1896), the syndrome of dyslexia, or specific reading disability, has continued to generate controversy as to its cause and treatment. The concept of dyslexia as primarily a perceptual problem resulting from subtle neurological disorder continues to persist. Orton's first theoretical paper on the topic (1925) describes letter or word reversals which were presumed to originate from incomplete cerebral dominance. Subsequent statements by Monroe (1932), Fernald (1943), and Bender (1957) also tended to promote the concept of developmental lag in perceptual abilities as causing reading disorders. These in turn led to a variety of programs, developed primarily in the 1960's, which purported to "treat" perceptual problems as a means of remediating reading disabilities. Kephart's (1960) approach, which focused on motor activities as a basis for developing perceptual skills, was typical.

In the same vein, but perhaps less theoretically accepted, were programs developed by Barsch (1965) and Delacato (1966) in which the evolutionary progression of physical movement patterns is seen as basic to complete perceptual development. Exercises for remediation of visual-motor deficits were the focus of approaches devised by Frostig (Frostig & Horne, 1964; Frostig, Lefever, & Whittlesey, 1964) and by Getman (1965). Cruickshank (1967, 1977) developed a unique classroom environment devoted to helping the learning disabled child compensate for certain visual-perceptual deficiencies.

Developing simultaneously, but with somewhat less of an impact, were programs based on the thesis that language disabilities are at the root of reading problems. Kirk (1966) developed an extensive program based on the assessment of underlying psycholinguistic abilities presumed to be related to reading. Both de Hirsch (1963) and Myklebust (1968;

Johnson & Myklebust, 1967) have also posited language problems as central to dyslexia. Myklebust's work derived from his extensive work with deaf and aphasic children, while de Hirsch's is an outgrowth of Orton's theory, which paradoxically seems destined to be better remembered for its emphasis on visual reversals of the printed letter or word than as a language-based theory. Popular too in this area was the work of Wepman (1961), who suggested that faulty discrimination of speech sounds is at issue in reading disability. Bateman (1964, 1971) also stressed language, though her approach to assessment and remediation is essentially eclectic.

It is important to point out the eclecticism of many of the above approches, which recognize the complexity of the reading process even while positing difficulties in one or another of its components as central to dyslexia (Fletcher & Satz, 1979; Wong, 1979a, b). The intersensory integration theory of Birch & Belmont (1964, 1965) was the first attempt to stress the relationship of the auditory and visual systems and dyslexic children's problems in transferring equivalent information from one system to the other. It is likewise important to note that the validity of many of the above theories has been seriously challenged, and that virtually none have resulted in cohesive remedial approaches that have proved consistently effective in well controlled studies. That letter or word reversals are evidence of a significant perceptual deficit, for example, has been widely questioned. Studies have shown that such reversals are often caused simply by the child being unaware that directionality of a letter (e.g., "b" vs. "d") is important (Moyer & Newcomer, 1977); that such reversals are rarely in a consistent direction as the theory might predict (Cohn & Stricker, 1979); that the types of reversal errors are similar for both good and poor readers (Holmes & Peper, 1977); and that reversals are more apt to result from linguistic rather than perceptual problems (Gupta, Ceci, & Slater, 1978; Vellutino, Smith, Steger, & Kaman, 1975).

Remedial programs based on the visual-motor perceptual approaches of Kephart, Getman, & Frostig generally have not been shown to result in significant reading improvement when subjected to well controlled study (Goodman & Hammill, 1973; Hammill, 1972; Keogh, 1974; Larsen & Hammill, 1975). Delacato's approach has been singled out for especially damaging criticism (Cohen, Birch, & Taft, 1970; Zigler & Seitz, 1975). Nor have psycholinguistic training programs fared any better. Reviews of studies using the Kirk approach (Hammill & Larsen, 1978), as well as studies examining the auditory discrimination deficit (Hammill & Larsen, 1974; Vellutino, 1979), have shown that both theories appear essentially nonvalidated. The intersensory integration approach has also been questioned, since research has failed to demonstrate that dyslexic children do poorly on such tasks when memory and linguistic factors are ruled out (Bryant, 1974; Friedes, 1974; Vellutino, 1979).

Despite disclaimers to the contrary (Cruickshank, 1977; Fletcher & Satz, 1979; Gross & Rothenberg, 1979; Lund, Foster, & McCall-Perez, 1978), theories developed in the 1960's have largely failed either to adequately

explain the problem of dyslexia, or to provide proven remedial approaches. The purpose of this paper is to briefly examine some recent concepts of reading disability and suggest implications for both assessment and remedial approaches. Before proceeding, however, it is important to discuss recent considerations regarding the definition of dyslexia.

DEFINITION AND RELATED CONSIDERATIONS

A central problem with any learning disability is that of defining it (Cohen, 1976; Keogh, 1976; Wong, 1979a). The consensus definition presented in Public Law 94-142, the Education for All Handicapped Children Act of 1975, stresses that a learning disability is a "disorder in one or more of the basic psychological processes involved in understanding or in using language, spoken or written, which may manifest itself in an imperfect ability to listen, think, speak, read, write, spell, or to do mathematical calculations" (Senf, 1978, p. 12). The definition goes on to mention that the term includes such conditions as dyslexia, but excludes learning problems resulting primarily from visual, hearing, or motor handicaps, or from mental retardation, emotional disturbance, or cultural disadvantage. Note the emphasis in this definition of learning disability as first and foremost a disorder in some underlying process.

Noting that there is even disagreement as to whether or not dyslexia exists, Rutter (1978) sees an acceptable definition of dyslexia as critical to further theoretical development. He stresses, as do Benton (1978) and Vellutino (1979), that definition is inevitably a process of exclusion—extraneous factors which might account for a reading deficit must first be ruled out. Establishing the existence of one or more underlying process disorders which account for a reading deficit is, then, the critical step in theory development. Torgesen (1977), however, makes the point that this step is fraught with difficulty because of confusion as to whether a poor reader is simply deficient in the underlying ability, or whether the ability is present but the task situation does not elicit it, a conclusion also reached by Mann (1979).

Another point made by these authors is that the syndrome of dyslexia includes many types of disorders. Earlier attempts at classifying dyslexic children include grouping poor readers either by auditory or visual deficits (Mykelbust & Johnson, 1962), or by primary dyslexia or dyslexia secondary to neurological deficits or emotional and environmental influences (Rabinovitch, 1962). Rutter (1978; Rutter & Yule, 1975) suggests classifying by severity of specific reading retardation, and demonstrates that severely disabled readers are both more numerous than would be predicted by normal curve distributions and are qualitatively different in a number of areas. Boder's (1973) scheme has three categories: dysphonetic dyslexics, who are poor in phonics; diseidetic dyslexics, who are poor in remembering the appearance of letters or words; and a mixed group who are deficient in both phonetic and sight-vocabulary skills. Mattis (1978; Mattis, French, & Rapin, 1975) groups dyslexics into those with language disabilities, articulatory and graphomotor

difficulties, and visual perceptual disorders. Denckla (1977) found the same three categories plus additional groups with verbal memory and sequencing problems.

Considerable definitional confusion also exists as to etiology (Tarjan & Forness, 1979). Genetic transmission continues to be seen as a possibility (Owen, 1978; Sladen, 1971), but it has recently been pointed out that methodological problems in genetic research on dyslexia have led to exaggerated claims of heritability (Coles, 1980). Since the classic study by Kawi & Pasamanick (1959) relating prenatal and perinatal factors to later reading disability, neurological disorders likewise continue to be seen as predictive of reading failure (Dalby, 1979). Although batteries designed to test "neurological readiness" in kindergarten, such as those of Jansky & de Hirsch (1972) or Silver, Hagin, & Beecher (1978), may identify as many as 80 percent of poor readers, the interaction of other within-child or environmental factors weaken the conclusion that a single factor such as neurologic deficit is responsible (Kavale, 1980; Mercer, Algozzine, & Trifiletti, 1979). Electroencephalographic studies, despite increasing sophistication (Hughes, 1978), have yet to suggest the nature of the relationship of abnormal EEG findings to dyslexia (Benton, 1978; Ross, 1976).

Confusion in etiology seems likely to rest on problems of definition and classification, as Benton (1978) has suggested. Most authors would be in some agreement that dyslexic children chosen for study should meet the following definitional criteria:

1. A severe level of reading impairment, usually two or more years below grade level and preferably demonstrated on an individual standardized test.

2. An intelligence quotient in at least the normal range.

3. An absence of uncorrected visual or auditory acuity problems, gross neurological or physical abnormalities, or pronounced emotional disorders or environmental disadvantage.

4. A reasonable period of adequate instruction in the regular grades which has included a balance of both phonetic and whole-word approaches.

As Vellutino (1979) has pointed out, the problems of meeting such criteria are formidable, but not insurmountable. Not only has the search for significant underlying disorders been hampered by lack of adherence to such a definition, but considerable confusion for parents and teachers might also be avoided if clinicians insisted on these as diagnostic criteria as well.

RECENT CONCEPTS

The concepts of dyslexia discussed below have been selected not only because they appear representative of those developed in the past ten years, but also because they would seem to have implications for common practices in diagnosis and remediation. They focus on such constructs as attention, memory, linguistics, maturational lag, and interactive factors as processes underlying dyslexia. Each can only be summarized here, but interested readers are referred to two excellent reviews by Benton & Pearl (1978) and Wong (1979a, b). As may be evident from the preceding discussion, many of the studies purporting to support the validity of these concepts tend to suffer, in many instances, from definitional and methodological shortcomings. Because of space limitations, these are presented rather uncritically herein, but the reader should be alerted to the tentative nature of this research.

Attention

That attention deficits are responsible for reading failure has been suggested by a number of authors (Dykman, Walls, Suzuki, Ackerman, & Peters, 1970; Hallahan & Kaufman, 1976; Senf & Freundl, 1971). Keogh & Margolis (1976) have proposed a three dimensional approach to the study of attention problems. Noting that attention has been investigated as largely a unitary phenomenon, they suggest that problems might occur in (a) coming to attention, (b) decision making based on attentional input, or (c) maintaining attention. Problems in coming to attention not only have to do with excessive motor activity or fidgetiness, but with focusing on relevant aspects of the task (Keogh, 1971); decision making may be impaired because of impulsive or rapid responses based on limited or fragmentary information (Becker, Bender, & Morrison, 1978; Douglas, 1972); and maintaining attention refers to problems in sustained attention or vigilance during prolonged tasks (Noland & Schuldt, 1971). Keogh and Margolis' formulations are quite comprehensive and well designed for usefulness in working with children. Ross' (1976) notion of selective attention is parallel to Keogh and Margolis' in some respects. He reviews studies which suggest that learning disabled children not only attend to irrelevant aspects of a task, but that cumulative effects of such incomplete information processing show up in subsequent acquisition.

Two other recent approaches have considerable heuristic value. Krupski (1980) proposes a four dimensional framework in which attending is viewed as either voluntary or involuntary and, at the same time, as either short term or sustained. Her approach provides a productive route for research on orienting responses, selective attention, vigilance, and related topics. Likewise, Koppell (1979) notes that a learning disabled child might attend intermittently to irrelevant aspects of a task, or with intermittent intensity to relevant aspects. At the same time, the child's inattention may be classified as general and pervasive (task independent), or linked only to the demands of certain tasks (task

dependent), Koppel questions whether attending problems are due to specific deficits or to a generally diminished processing capacity, and suggests that attentional deficits may not necessarily be causes of reading disability but may result from a poor reader's previous failure experiences or anxiety about task performance. These multiple aspects of attending behavior are apparent in a recent study by Pelham (1979) in which poor readers had very heterogeneous performance on four selective attention tasks, and the tasks themselves were found to be measuring very different constructs. Likewise, Haskins & McKinney (1976) have shown that impulsivity in responding may be less significant than accuracy in attending.

Memory

One aspect of memory which has been mentioned as a cause of dyslexia is difficulty in serial order recall, or the ability to remember letters or other items in sequence (Bannatyne, 1974; Kirk & Kirk, 1971). Bakker (1972) has studied poor readers using a variety of temporal-order tasks in visual, auditory, and tactile modalities, and has concluded that deficits in both perceiving and recalling a sequence of events are directly related to reading disability. His idea received partial support in studies by Senf (1972; Senf & Freundl, 1971) on Lisensory memory, recalling a series of digits presented simultaneously in both visual and auditory modes. Poor readers were not only deficient on these tasks compared to normal readers, particularly when there was a half second or longer interval between digits, but also seemed less able to recall visual items when material was presented in both senses. Subsequent studies, however, by Davis & Bray (1975) and Vellutino, Smith, Steger, & Kaman (1975) which de-emphasized tne memory skill involved (for example, by having children recall the temporal order of only two digits in the series rather than the entire series) suggest that gross memory and not temporal sequencing are involved.

Senf (1976) also seems to emphasize that memory skills may be more at issue. He posits an information processing system in which reading deficits are caused either by a child failing to receive adequate information presented in one or the other sensory modalities, or failing to relate it to his or her existing information array, which might itself be diminished because of previous faulty information. His system stresses the notion of a feedback loop in which the reader acts on incoming information by relating it to previously stored information as well as sounds, sights, and other sensations occurring at the same time. Senf suggests that attention deficits may not be primary disorders, but are secondary to previous problems in organizing and processing information. Some support for Senf's thinking comes from Morrison, Giordani, & Nagy (1977), who showed that poor readers did as well as normal readers in the initial phase of processing when information is first perceived (zero to 300 milliseconds), but did not do as well in the memory or encoding stage (300 to 2000 milliseconds) when information has more time to be assimilated. Calfee's (1977) findings also stress a memory factor. He noted that, in the left-to-right format of matching used in most reading

readiness tests, the child's visual after-image of the letter begins to fade as he moves from item to item to find the correct match. When memory factors were diminished by having the letter surrounded by possible items to be matched, Calfee found a much higher percentage of accuracy.

Language

Although linguistic deficits have been posited as underlying dyslexia (Kirk & Kirk, 1971; Mykelbust, 1968), as mentioned earlier, relatively less attention has been paid to this area until recently. Vellutino (1978; 1979; Vellutino, Steger, Moyer, Harding, & Niles, 1977) suggests that subtle disorders in language may be primarily responsible for reading disability, and that validity of previous research on perceptual deficits should be questioned because of failure to take language factors into account on tasks which supposedly measure perception. In support of his hypothesis, Vellutino has conducted a number of studies. He has shown that poor readers could both perceive and reproduce potentially confusing words (e.g., was/saw, calm/clam), but could not name them as well as normal readers (Vellutino, Smith, Steger, & Kaman, 1975). Using recall of unfamiliar symbols to reduce the effects of verbal deficits, he demonstrated that reading disabled children made no more orienting or sequencing errors than normal children (Vellutino, Steger, Kaman, & DeSetto, 1975). In another study (Vellutino, Harding, Phillips, & Steger, 1975) poor readers made more mistakes in visual-verbal associations, but were similar to normal readers on nonverbal learning. Vellutino, Smith, Steger, & Kaman (1975) have also shown that, even though dyslexic children mispronounced a word, they could still name its letters in sequence.

Vellutino's ideas also received independent support in studies reviewed by Benton (1975), and from the fact that nearly half the children referred to reading clinics have a history of speech and language difficulties (Ingram, Mason, & Blackburn, 1970; Lyle, 1970). Other studies by Kastner & Richards (1974) suggest that poor readers are inferior in using verbal mediators in nonverbal sequencing tasks. Liberman (1971; Liberman, Shankweiler, Orlando, Harris, & Berti, 1971) shows that orienting and sequencing difficulties account for only one-fourth of total reading errors, and that the majority of errors seem to be due to linguistic intrusion problems.

Vellutino (1978, 1979) suggests that language deficits underlying dyslexia could take the form of subtle disorders in semantic processing, syntactic difficulties, and phonological problems. In addition to his own studies, he cites as evidence the work of several authors. For example, Waller (1976) showed that poor readers could remember basic meanings of sentences, but made more errors than normal readers on exact sentence order, tense markers, and plurality indicators. Perfetti, Finger, & Hogaboam (1978) presented disabled readers with colors, digits, pictures, and words and discovered they did less well than normal readers

in naming words but not nonverbal stimuli. Denckla & Rudel (1976) described dyslexic children as "subtly dysphasic," since they were slower than both normal and generally underachieving children in rapidly naming pictures of common objects, numbers, letters, and colors. Vogel (1974) found that young dyslexic children were markedly inferior on a variety of measures of grammatic competence. Liberman, Shankweiler, Fisher, & Carter (1974) and Helfgott (1976) demonstrated that poor readers have great difficulty in segmenting words into individual phonemes and that ease in sound-symbol association, or sounding out words, predicts which children will be better readers.

Vellutino (1979) suggests that the fluent reader is a "verbal gymnast" who is able to rapidly cross reference visual information and has a variety of ways of identifying and extracting meaning from words in context. The dyslexic child, on the other hand, is not only less flexible and adept, but seems unaware of the importance of many of these aspects of language. Although his seeming overreliance on linguistic deficits has been questioned (Fletcher & Satz, 1979), Vellutino's approach holds considerable heuristic promise.

Maturational Lag

The notion that certain skills may develop more slowly in reading disabled children has been suggested by Satz and his colleagues (Satz & Fletcher, 1980; Satz, Taylor, Friel, & Fletcher, 1978; Satz & Van Nostrand, 1973). They contend that sensory perceptual skills, which are in their ascendancy in primary school years, are likely to be delayed in younger dyslexic children, and that conceptual linguistic skills, which develop in later elementary school years, mature more slowly in older dyslexics. According to this view, younger dyslexic children may eventually mature in perceptual skills related to beginning reading, but will consequently lag in conceptual and linguistic skills needed for later reading competence. Should such skills not develop by adolescence, a permanent deficit in reading might occur. This approach reflects theories in which developmental processes evolve into increasingly more integrated stages (Luria, 1966; Piaget, 1926).

It should be noted that the contentions of Satz and his colleagues derive from a single longitudinal study of over 400 male children who began kindergarten in 1970 (Satz & Fletcher, 1980; Satz & Friel, 1978; Satz, Taylor, Friel, & Fletcher, 1978). Their results generally confirm that visual perceptual skills precede conceptual linguistic skills in learning to read, and that each set of skills is differentially delayed in younger and older dyslexic children. They also found that only six percent of the most severely disabled readers improve over time, a finding confirmed by Rourke & Orr (1977). Severe cases were those from one to two-and-a-half years below grade level and comprised some 12 percent of their sample. Tests of finger localization and alphabet recitation were among the most consistent predictors, along with socioeconomic class, while subsequent study of language measures by Satz, Taylor,

Friel, & Fletcher (1978) showed grammatic closure and receptive vocabulary as highly predictive. Wong (1979b) notes that Satz' findings have been supported in independent studies and suggest that the concept of age related changes serves to clarify use of predictive screening batteries.

Torgesen (1977, 1979) extends the concept of maturational lag to the dyslexic child's approach to tasks which are critical to reading. Noting that learning disability theorists stress underlying deficits within the child, he views the child's learning strategies as equally important. Torgesen sees the dyslexic child as less of an "active agent" in his or her own learning. He cites as examples Schiffman's (1972) notion of selective attention as requiring active concentration, Hagen's (1971) idea that use of reversal techniques can compensate for memory problems, and Flavell's (1971) concept of "meta memory," or awareness of one's own memory processes, as important to recall. In the preschool years, learning proceeds through interaction with the environment, but school tasks require that the child more actively generate his or her own cognitive associations. The dyslexic child, Torgesen contends, may enter school with less well developed abilities to structure his or her own learning. He also notes that cumulative effects of such difficulties lead to reduced self confidence and less willingness to approach new tasks, as Shaw (1968) suggests. Torgesen has demonstrated how poor readers can be trained to improve their orientation to tasks, and thus "catch up" with normal readers (Torgesen, Murphy, & Ivey, 1979).

Interactive Factors

As implied by Torgesen (1977, 1979), a mismatch between the dyslexic child's specific pattern of strengths and weaknesses and the type of instruction he or she receives could contribute to the development of a reading disability. This idea has been advanced by Adelman (1971, 1972), who proposes that the discrepancy between child characteristics and the classroom environment may even be a primary reason for some learning problems. Adelman rejects the notion of the "disabled" child; he suggests that the greater the teacher's ability to individualize instruction, the less likely it is that reading failure will occur. Less effective teachers, on the other hand, might unwittingly contribute to reading disorders because of their failure to take into account individual differences in sensory, perceptual, linguistic, cognitive, or motivational variables. A corollary hypothesis is that matching kindergarten children having certain learning patterns to teachers whose instructional style represents the "best fit" may even prevent some cases of reading disability (Adelman, 1972). Adelman also proposes diagnosis by instruction, in which formal testing is de-emphasized and the dyslexic youngster's response to various remedial approaches serves as the basis for determining his or her needs.

While his theory seems logically compelling, Adelman has provided only limited empirical support for his contentions. Although Feshbach, Adelman, & Fuller (1977) have shown that reading failure does appear to vary with first grade classroom experience, a specific cause and effect relationship has not yet been demonstrated. Indeed, a large body of research exists in which poor readers have been matched to instructional programs based on their presumed deficits in either auditory or visual processing (Arter & Jenkins, 1977; Tarver & Dawson, 1978), but results have been singularly disappointing. Baron (1979) has shown, however, that failure to develop skill in phonetic or whole-word approaches to reading may be a function of the type of instruction the child has received. Thomas & Chess (1977) have even proposed that a child's temperament could be inadequately matched with that of his or her teacher's, thereby leading to reduced opportunity for effective reading instruction.

IMPLICATIONS FOR ASSESSMENT

Some general conclusions can be derived from the above discussion. A common theme is the complexity of dyslexia and the need for valid subclassifications of dyslexic children. Most authors would admit that both sensory perceptual and conceptual linguistic factors are implicated as underlying factors, but several seem to conclude that the perceptually impaired no longer comprise the largest number of dyslexic children (Benton, 1978). Developmental lag is also postulated as significant in several instances. Regardless of the particular deficits described, some authors seem to insist that observed process deficits do not necessarily differentiate between good and poor readers; rather, the difference is in the rate at which these critical skills mature. Finally, there are several cautions against imputing one specific cause to failure on a school task or test item, since several other factors could be operating.

Implications for identification and diagnosis are numerous. Early identification of potential reading difficulty through predictive test batteries is often valid, as mentioned earlier. Keeney & Keeney (1968), moreover, have shown that when the diagnosis of dyslexia is made in grades one or two, the prognosis for remediation may be good in nearly four of every five cases; however, in grade three or later, the prognosis drops to nearly half that figure and diminishes quite rapidly thereafter. School psychologists and other professionals are therefore understandably eager to initiate early identification programs in the kindergarten years. The leap from identification to diagnosis for remedial purposes is hazardous, however, in light of suggestions by Koppell, Torgesen, Vellutino, and others that a child's approach to tasks may result in performance which is not necessarily reflective of deficits a test item purports to measure. Poor performance on a "visual-perceptual" test, for example, might reflect intermittent attention, short term memory problems, subtle linguistic disorder, or even poor self concept. Furthermore, Senf's work shows that deficits in certain skills may be more critical at

different ages, and a study by Glazzard (1979) illustrates differences in the predictability of tests each year over grades one through four. Prescribing specific remedial programs on the basis of kindergarten testing may have to rest more on the child's approach to test items, coupled with teacher and parent observations of similar characteristics, than on test scores or profiles. Keogh & Becker (1973) have cautioned against premature labeling of very young children as learning disabled, given not only the concept of maturational lag, but the tenuous effectiveness of remedial programs at the kindergarten level.

Diagnostic testing of dyslexic children has come under considerable criticism of late. In an extensive review of the ten most commonly used tests and evaluations for learning disabilities, Coles (1978) questions the validity of their use for differential diagnosis between learning disabled and other types of children. Further skepticism of intellectual, perceptual, and achievement test results emerges from the notions discussed above on effects of attention, memory, linguistics, and related variables on task performance. Although intelligence testing is critical, a study by Smith, Coleman, Dokecki, & Davis (1977a) of 200 children in classes for the learning disabled showed that nearly two-fifths did not meet the criterion of normal intellectual ability. Assumptions behind achievement testing should also be looked at more closely, given the definitional aspects of dyslexia discussed earlier. Although Vellutino (1979) insists on reading scores two years below grade level before a formal diagnosis can be made, McLeod (1979) has shown how regression and measurement errors inherent in both intelligence and achievement testing can affect assumptions that a significant discrepancy exists, even when reading scores are low. Achievement tests have also been shown to reflect curriculum bias. When Jenkins & Pany (1978) compared content of five commonly used achievement tests with that of five popular reading programs, grade equivalent scores varied as much as two years at a single grade level, depending on which test was used to measure reading skills in a particular program.

Establishing the existence of underlying process disorders related to the presence of a reading disability involves several commonly accepted practices, some of which may be questionable in light of the above review. The common procedure of analyzing clusters of IQ subtests to establish sequential memory deficits (Bannatyne, 1974; Smith, Coleman, Dokecki, & Davis, 1977b) must be questioned, given the diminished emphasis on Bakker's theory of temporal-order sequencing, at least relative to other aspects of memory. While the same can be said for clusters presumed related to "spatial-perceptual" skills, a child's performance on "verbal-conceptual" subtests might eventually be viewed with increased significance, given Vellutino's contentions. Although auditory discrimination and visual-motor perceptual tests are popular with learning disability clinicians (Coles, 1978; Hansen, 1970), their use would also seem less advisable, given not only limited theoretical emphasis on such deficits but also the admittedly smaller numbers of learning disabled children in whom perceptual deficits are regarded as

contributory. Keogh & Smith (1967) have shown rather convincingly how poor visual-motor performance does not seem to differentiate between good and poor readers over time.

On the other hand, careful speech and language evaluation, developmental language histories, teacher and parent reports of language use, and language samples might be stressed, particularly if Vellutino's theories continue to receive empirical support. Discovery of subtle deficits in vocabulary use, syntactic structure, and phonetic decoding might prove to be valuable diagnostic signs. ITPA subtests may also be helpful in this regard, even though their validity for subsequent remedial use is suspect (Waugh, 1973), and measures of language functioning have been found useful (Hessler & Kitchen, 1980; Wiig, Semel, & Abele, 1981). Direct observation of a child's approach to task situations, either in the classroom (Forness & Esveldt, 1975) or in the testing situation (Forness, 1975a), would likewise seem essential to pinpoint attention problems or inefficient learning strategies. Particularly important would be teacher reports on the child's learning style, given the concern of Senf, Torgesen, and others on active participation in information processing situations. Questioning a child on his or her approaches might also reveal the nature of problems in organizing and structuring incoming information. Finally, teacher and parent interviews would seem critical to rule out the possible contribution of narrowly focused or inefficient reading instruction. While informal assessment may have disadvantages (Kratchowill, 1977), recent theories increasingly warrant such techniques with dyslexic children, in the absence of valid standardized approaches (Adelman, 1978; Ysseldyke & Algozzine, 1979).

IMPLICATIONS FOR INSTRUCTION

Remedial instruction of dyslexic children has been beset by some of the same problems in definition mentioned earlier. Few valid subclassifications of dyslexia exist which enable teachers either to group such children for instructional purposes or to match a particular remedial program to an individual child (Zigmond, 1978). The concepts discussed above would seem to de-emphasize specific training in perceptual skills as requisite to reading success. Comprehensive reviews of remediation by Hallahan & Kaufman (1976), Savage & Mooney (1979), and Spache (1976) would seem instead to stress intense individualized instruction which focuses on direct teaching of reading skills, with ongoing clinical observation as the criterion for selection of techniques and materials.

Some general guidelines emerge. As Guthrie (1978) has pointed out, daily instruction is needed to produce gains in disabled readers. Focus should be on decoding skills, i.e., saying aloud the sounds of letters, letter combinations, and words. Immediate feedback, both in the form of corrections for errors and praise for progress, is essential. As reading skill develops, increasing emphasis should be placed on word

meaning and on developing semantic and syntactic relationships among words. An accepting emotional climate and opportunities to develop listening skills (e.g., being read to) are also important. A unique study by Neeley & Lindsley (1978) seems to reiterate these principles. They studied three years of performance charting on individual pupils by "precision" teachers who used 17 commonly used reading curricula. Not only did different programs yield almost identical learning, but findings suggested that reading errors were important opportunities for new learning.

Beyond these general principles, however, recent concepts suggest further possibilities. For example, attention and memory problems may necessitate special strategies for certain dyslexic children. Techniques designed to teach impulsive children to monitor, evaluate, and reinforce their own behavior in problem solving situations have been extensively reviewed by Polsgrove (1979). Such approaches involve having children pause before responding in order to rehearse appropriate strategies, and then guide themselves through the task. Parents and peers can also be influential in teaching or demonstrating these attending strategies (Glenwick & Barocas, 1979; Heffernan & Forness, 1972; Nagle & Thwaite, 1979). Emphasis should be on moving away from external reinforcers and toward assisting children to develop their own internal reinforcement systems (Blair, 1972; Forness, 1973). The more extreme attention problem of hyperactivity may require combining these approaches with other forms of treatment, even medication, although evidence suggests only short term and limited use, with continuous and rapid movement toward internal controls (Forness, 1975b; Loney, 1980). More to the point, however, are techniques directing a child's attention to reading processes. Recent work by Schworm (1979) demonstrated how training poor readers to focus their attention selectively on the middle of words, along with pretraining on patterns of vowel sounds, significantly improved reading performance. For memory problems, Torgesen's ideas suggest techniques similar to the self monitoring approaches just described. Training in different ways to remember (e.g., orienting, rehearsal, mnemonics), plus helping a child to be aware of when to use each strategy, may be effective with some dyslexic children (Wong, 1980). Torgesen's recent research (1979, 1980) shows that it is often difficult to predict which children will show improvement with these techniques.

Linguistic approaches should receive renewed attention. Vellutino (1979) advocates that teachers assess a child's limitations in pronunciation, word meaning, grammar, and other aspects of language. Instruction should be well balanced, with emphasis on both phonics and whole-word strategies and with training in both dividing words phonetically and discriminating between printed letters (as long as the latter does not take place out of context). Letter sounds should be taught according to syllables as much as possible. Words, on the other hand, should be presented both within sentences for meaning and in isolation for analysis of their structure. Vellutino feels that general language

enrichment may prove helpful and that teachers should encourage "cross referencing," in which the presentation of a word emphasizes its appearance, pronunciation, meaning or function, derivative forms, and use in various contexts, and includes having the child generate his or her own sentences. Such enrichment might also include listening to stories, telling stories, and any related activities "that facilitate elaborated use of new words . . . . (and) render the structure and unique characteristics of language itself the object of study" (p. 362).

While research on linguistic remedial approaches is sparse, such techniques have the advantage, as mentioned earlier, of focusing on direct instruction of reading skills. Giordano (1978) has reviewed research on language and reading and also supports the notion of incorporating at least one other language modality into every reading exercise. Recent evidence by Allington & Fleming (1978) suggests that poor readers profit from being able to use semantic and syntactic cues in word recognition. Likewise, children in reading programs which stress phonetic decoding have been shown to do significantly better than those in other types of curricula (Silberg, Iverson, & Goins, 1973; Wallach & Wallach, 1976). Given Satz' contentions that visual skills lag more significantly in younger dyslexics, however, some caution might be warranted; Silver, Hagin, & Beecher (1978) have demonstrated success with more visually oriented programs for very young children. The nature of reading instruction needed for older children may be more as Vellutino suggests, but that needed by dyslexic adolescents and adults is not yet clear (Frauenheim, 1978; Lindsey & Kerlin, 1979). The marked success of DISTAR programs over other approaches (Becker & Engleman, 1977) would nonetheless argue convincingly for direct, language based reading instruction. Renewed interest in both the Fernald method (Miccinati, 1979) and color phonics techniques (Johnson, 1978) might occur because of their emphasis on direct instruction in sound-symbol relationships. Such approaches also seem to include components which could attenuate attention and memory deficits.

To conclude, it should be stressed that considerable overlap exists among recent approaches to dyslexia, and both continuing definitional problems and conflicting evidence make it difficult to give definitive recommendations to practitioners. Resurgence of conceptual linguistic theories and agreement on the efficacy of direct instructional approaches seem nonetheless to characterize much of the last decade's thinking. A reasonable conclusion is Benton's (1978) statement that effective clinical teaching continues to be a process of manipulating multiple variables to discover the unique learning patterns of each dyslexic child.

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